DOCUMENT RESUME

ED 286 832 SP 029 310

AUTHOR Sears, Constance; Husak, William S.
TITLE Contextual Effects in an Educational Setting: An Example of Level Three Research.
PUB DATE 87
NOTE 19p.; Paper presented at the National Convention of the American Alliance for Health, Physical Education, Recreation and Dance (Las Vegas, NV, April 13-17, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Drills (Practice); Intermediate Grades; Physical Education; *Psychomotor Skills; Research Methodology; Secondary Education; *Skill Development; *Volleyball

ABSTRACT

A systematic three-level ("Level 3") approach to research in the motor behavior area was used to investigate the influence of varying degrees of contextual interference in the acquisition of volleyball serving skills. One hundred and twenty-eight middle school subjects learned three volleyball serves during a 3-week long unit in a physical education activity class. Subjects were divided into three groups: one followed a blocked schedule, another a serial schedule, and the third a random schedule of practice. Subjects were given skills tests with both subjective and objective criteria following completion of the unit. Results indicated no differences among groups, suggesting that laboratory findings in the the area of contextual interference do not necessarily generalize to practical settings. (CB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Contextual Effects in an Educational Setting: An Example of Level Three Research

Constance Sears and William S. Husak

California State University, Long Beach

ED286832

Running head: Level Three Research

BEST COPY AVAILABLE

SP029510

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

C Sears

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Abstract

Christina (1987) has proposed a systematic three level approach to research in the motor behavior area. This study was an example of Level 3 research and investigated the influence of varying degrees of contextual interference in the acquisition of volleyball serving skills. One hundred and twenty-eight middle school subjects learned three volleyball serves within one of three practice schedules. This process took place during a three week long unit in a physical education activity class. Group one followed a blocked schedule, group two a serial schedule, and group three a random schedule of practice. Upon completion of the three week unit the subjects were given skills tests incorporating both subjective and objective criterion. The results of the analysis indicated no difference existed among groups. These results suggest that laboratory findings in the area of contextual interference do not necessarily generalize to practical settings. These findings also support Christina's contention that a need exists to conduct more Level 3 research in the motor learning area.

Contextual Effects in an Educational Setting: An Example of Level Three Research

A three-level systematic approach for research in motor learning and control has been advocated by Christina (1986). The third level of this approach is deemed to have the most relevance for the practitioner. This study, which is an example of Level 3 research, investigated the use of contextual interference as it relates to the acquisition of motor skills.

The three levels outlined by Christina start with the "most basic research on human motor learning to the most applied research divided according to their relevance for providing solutions to practical problems" (Christina, 1987). Most of the research for the past fifteen years has been conducted at Level 1. Level 1 employs basic research and according to Christina has the least direct relevance for the practitioner. Christina defines the ultimate goal achieved by each of the three levels. The goal established at Level 1 is to "develop theory-based knowledge appropriate for understanding the learning of many different motor skills in a variety of settings with no requirement to demonstrate its value for solving practical problems" (Christina, 1986). Level 1 research tests hypotheses in a strict laboratory setting generating little if any relevance for the motor skills performed in a practical setting. Level 2 utilizes applied research and has moderate direct relevance for the practitioner. The ultimate goal of Level 2 is to "develop theory-based knowledge appropriate for understanding the learning of practical skills in practical settings with no requirement to find immediate solutions to practical learning problem" (Christina, 1987). Level 3 is deemed to have the most direct relevance for the

practitioner. The ultimate goal of Level 3 research is to "find settings with no requirement to develop theory-based knowledge at either Level 1 or Level 2" (Christina, 1987).

As evidenced through a lack of research at Level 2 and Level 3, both these Levels were viewed as completely dependent on the findings of the basic research of Level 1. Applied research has great potential for aiding the practitioner in the field setting. The purpose of this paper is to take a research area in motor learning and offer suggestions how contextual interference effects may be applied by the teacher and coach. The efficacy of Christina's three level approach to conducting research will be discussed from the practitioner's perspective.

The application of theoretical data gathered in the laboratory setting to the educational setting is addressed in this paper. The need for this undertaking is supported by Sage (1971) who states that "the scientific investigation into motor skill acquisition has been largely conducted by experimental psychologists and only recently by physical educators" (p. 292). Bucher and Koenig (1978) refer to a "gap between what is known and what is applied to teaching motor skills" (p. 266). A great deal of motor learning research stresses the need for the practical usage of data obtained within the laboratory setting by the practitioner (Goode and Magill, 1986: Shea and Morgan, 1979: Bucher and Koenig, 1978).

The idea of contextual interference first introduced by Battig (1966), was the theory applied in the educational field for the purpose of this investigation. Contextual interference in motor learning has generally referred to the amount of change in either environmental or response conditions from trial to trial. The more change that exists,

the greater the contextual interference. There has been little research in the area of contextual interference as it relates to the acquisition of motor skills. What little research has been completed has not been conclusive in determining the effects of contextual interference on skill acquisition and retention (Shea and Morgan, 1979). The effects of contextual interference in the motor skill area were first studied by Shea and Morgan (1979). The subjects in this study practiced movement patterns using a barrier knock down task in a prescribed order. Two practice schedules were utilized. One group practiced under blocked (low interference-low cognitive effort) conditions. The second group practiced under random (high interference-effortful problem solving) conditions. This study indicated a decided advantage of the random over the blocked presentation in motor skill retention and transfer. In applying their findings to the educational setting Shea and Morgan (1979) suggest "the instructor should teach a number of skills during each session for a number of sessions in order to achieve maximum retention and transfer" (p. 187).

Lee and Magill (1983) attempted a replication of the Shea and Morgan study and added a serial group in an effort to investigate the locus of contextual interference. The serial practice schedule utilized all three movement patterns in a prescribed, set sequence. Once again this study supported the superiority of random scheduling over blocked scheduling for retention and transfer levels. The serial group scores were similar to those of the random group. Lee and Magill explain the similarity of scores as "the increase in effortful processing due to random and serial practice schedules is manifested because subjects must actively regenerate a new movement plan on each trial during the

acquisition phase. Whereas under blocked practice schedules action plans may be passively remembered on each subsequent trial" (p. 744).

The interaction between cognition and motor control and their combined affect on skill acquisition is demonstrated within motor learning research (e.g.: Lee and Magill, 1983: Del Rey, Wughalter and Whitehurst, 1981: Shea and Morgan, 1978). The common element evident within the research is the concept of cognitively effortful problem-solving activities (Lee and Magill, 1983) to enhance the retention level of the performer. Simply stated the more effortful the problem-solving process the greater the retention level. The validity of this is also supported by laboratory research as well. Retention is better when the task is learned under a distributed practice schedule (controlled high interference) than under a massed schedule (passive process) (Sage, 1971). A correlation appears to exist between the findings of motor learning research and the verbal learning results of Battig (1966). However, according to Sage (1971) it has been suggested motor skills are less susceptible to interference effects than are verbal habits.

This paper examines the theory of contextual interference and its implications within the field setting. This direct application of applied research is an example of the Level 3 research by Christina.

Method

Subjects

The subjects were one hundred and twenty-eight middle school students (grades six and seven). All subjects were unpaid and were naive as to the purposes of this investigation. All subjects were members of the required physical education classes.

Task

The task given to the subjects was to learn the three general types of volleyball serves: underhand, overhand and sidearm (Meyer and Schwarz, 1965). Both instruction and practice sessions were completed on a regulation court with a regulation net as mandated by the current National Federation edition Volleyball Rule Book. Each volleyball used during the testing met the requirements estalished by the National Federation of State High School Associations. All serves were scored against objective and subjective criterion.

Objective Criterion: All three types of serves were tested using a modification of the Russell and Lange, 1940. The court being of regulation width and length and the net being of regulation heighth, special court markings were chalked on the ground: (1) chalk line across five feet inside and parallel to end line (2) chalk line across court parallel to and 12 1/2 feet from the line under the net (3) chalk lines five feet inside and parallel to each side line, extending from line under the net to line. Each serve was scored according to the value of the target area in which the ball landed (see figure 1). A ball landing on a line separating two areas was given the highest value (Clarke, 1976). Serves in which foot faults occurred scored zero. "Let" serves were repeated.

Insert Figure 1 about here

Subjective Criterion: Each of the three serves were tested against descriptors and assigned a point value. For each set of descriptors

an overall subjective score was given for each type of serve.

The point values were as follows:

5 Excellent

4 Above Average

3 Average

2 Below Average

1 Weak

The descriptors for the three serve types were as follows:

Underhand Serve

1. Ball on the right side of the body
2. Left foot forward
3. Shoulders square to the net
4. Forward swing is forward and upward in line with the body
5. Follow through-arm swing upward, moving in direction the ball is to go.

Overhand Serve

1. Ball held in both hands in front of body and slightly to the left
2. Left foot pointing toward the net right foot parallel to endline and behind it
3. Shoulders square to the net
4. Knees slightly flexed
5. Transfer weight forward (from rear foot to front foot)
6. Follow through in the direction of the path of the ball, then arm swing downward across body

Sidearm Serve

The sidearm serve is similar to the position of the body and the technique used for the underhand. The underhand criterion descriptors

were applied to the sidearm serve. One additional descriptor was added for the sidearm: The arm swing is horizontal with the floor.

Insert Figure 2 about here

Design and Procedure

A set instruction and practice schedule was established for each group of subjects. The classes were then randomly assigned to one of three practice schedule groups: blocked, serial or random. The entire unit was then broken down into instructional and practice time allocations providing each group with equal instruction and practice time.

Identical instruction, verbal and demonstrations, were given according to the schedule to each group for each type of serve. Prior to the testing phase one session was designated a review session. The practices during this review session were still in keeping with the practice schedule established for the group. Each subject was given verbal feedback as to his/her individual performance.

To avoid any bias on the part of the experimenter, another physical education teacher from the site assigned the point values for the subjective criterion. An aide recorded the scores for each subject. Each subject had been randomly assigned a number prior to the testing.

During the testing the experimenter stood in the court marked with the specific target areas. The experimenter called out the score after the ball bounced in the target area. The subject stepped up to the

service area, gave his/her number to the aide recording the scores. Each subject served five times for each type of serve. The five scores were then averaged in order to compute one objective score for each of the three types of serves. The testing lasted for three sessions, one type of serve being tested each session. Though a random ordering during the testing session might be preferred it was our attempt to insure the feasibility of the testing situation for the field setting.

Results

The mean and standard deviations for the objective and subjective scores appear in table 1. Six one way analysis of variances (ANOVA) were conducted to determine if any differences existed in the serve evaluations as a function of the practice schedules. The results of these one-way ANOVA's for both the objective and subjective criterion revealed no significant findings, $F(2,113) < 1$. It may be concluded that the manner of presentation and practice of the three types of volleyball serves does not influence the learning of these skills. From a practical perspective, the extraneous variables that contaminate applied research settings, and which are often controlled for in Level 1 and 2 experimentation, appear to negate the contextual interference effect. Therefore, previously established contextual interference phenomenas may have little or no relevance for the practitioner.

Insert Table 1 about here

Discussion

The results of this study reinforce the dilemma of applied research in the motor behavior area in the last twenty five years. That dilemma, simply stated, is that researchers have not taken Level 1 research to its ultimate conclusion, that being practical application.

Christina (1986) suggested two possible reasons for this. The first states that "our present fundamental knowledge of motor learning is not adequately developed in most instances to make such applications. This may indeed be true, however, questions must be asked such as, "How do we determine when enough knowledge has been gathered in order to make the shift? Who makes those decisions? Why has it not stopped other fields, such as industrial psychology/education, from developing all three levels simultaneously?"

We believe the second reason may be more profound, and one which is strongly implied by Christina. Applied research has typically not received the prestige from fellow investigators nor the recognition it deserves from professional conferences and publications. Such an attitude does not promote the undertaking of applied research, much less its growth and development.

A third, more subtle factor, may also be contributing to this lack of applied research in motor learning. Many graduates of doctoral programs are being trained with a basic research orientation. As such, they tend to shy away from conducting applied research because of a lack of training and appreciation.

We agree with Christina (1987) that the time has come to restructure the views guiding research efforts in motor learning. These three levels are indeed separate yet complimentary. To that degree, it is

quite possible that each level will contribute to existing theories, formulate theories that may be specific to its own level, and ultimately contribute to models that will enable us to better understand and explain human motor learning and performance.

References

Battig, W.F. (1966). Facilitation and interference. In E.A. Bilodeau (Ed.), Acquisition of Skill. New York: Academic Press.

Bucher, C.A., & Koenig, C. (1978). Methods and Materials for Secondary School Physical Education. Saint Louis: C.V. Mosby Company.

Christina, R. (in press). Whatever happened to applied research in motor learning? In J. Skinner (Ed.), Future Directions in Exercise/ Sport Research. Champaign, Il: Human Kinetics.

Christina, R. (1987). Motor learning: future lines of research. In M.J. Safrit & H.M. Eckert (Ed.), The Cutting Edge in Physical Education and Exercise Science Research, American Academy of Physical Education Papers (No. 20), Champaign, IL: Human Kinetics Publishers.

Clarke, H.H. (1976). Application of Measurement to Health and Physical Education. Englewood Cliffs, N.J.: Prentice Hall.

Del Rey, P., Wughalter, E. & Whitehurst, M. (1982). The effects of contextual interference on females with varied experience in open sport skills. Research Quarterly for Exercise and Sport, 53, 108-115.

Goode, S. & Magill, R. (1986), Contextual interference effects in learning three badminton serves. Research Quarterly for Exercise and Sport. 57, 308-314.

Lee, T., & Magill, R. (1983). The locus of contextual interference in motor skill acquisition. Journal of Experimental Psychology: Learning, Memory, and Cognition,9, 730-746.

Sage, G.H. (1971). Introduction to Motor Behavior: A Neuropsychological Approach. Reading, MA: Addison-Wesley Publishig Company.

Shea, J. & Morgan, R. (1979). Contextual interference effects on the acquisition, retention, and transfer of a motor skill. Journal of Experimental Psychology: Human Learning and Memory, 5, 179-187.

Table 1.

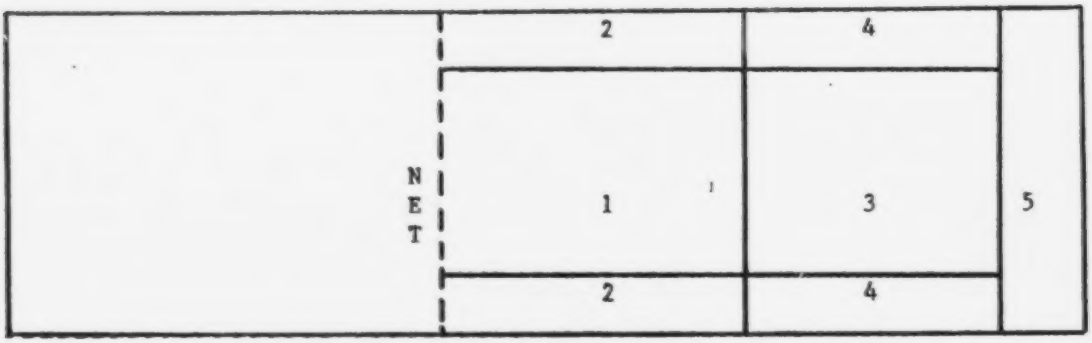
Means and Standard Deviations of the Objectives and Subjective Scoring of the Three Types of Volleyball Serves as a Function of the Degree of Contextual Interference.

	OBJECTIVE			SUBJECTIVE		
PRACTICE ORDER	UNDERHAND	OVERHAND	SIDEARM	UNDERHAND	OVERHAND	SIDEARM
BLOCK	2.3	1.9	2.0	3.1	3.0	2.9
SERIAL	2.3	1.7	2.2	3.2	2.9	3.1
RANDOM	2.5	1.6	1.8	3.3	2.9	2.9

Figure Caption

Figure 1. Schematic of court markings for the objective portion of the volleyball skill test.

Figure 2. An example of the data sheet for the subjective portion of the volleyball skill test.


2
4
NET
1
3
5
2
4

SUBJECT	UNDERHAND		OVERHAND		SIDEARM	
	OBJ.	SUBJ.	OBJ.	SUBJ.	OBJ.	SUBJ.
1	3	3	4	4	4	3
2	2	3	5	4	5	3